

1.1GHz Low Power Two-Modulus Prescaler

The MC12022SLA can be used with CMOS synthesizers requiring positive edges to trigger internal counters such as Motorola's MC145XXX series in a PLL to provide tuning signals up to 1.1GHz in programmable frequency steps. This device is a reduced current version of the MC12022A/B.

The MC12022SLB can be used with CMOS synthesizers requiring negative edges to trigger internal counters.

A Divide Ratio Control (SW) permits selection of a 64/65 or 128/129 divide ratio as desired.

The Modulus Control (MC) selects the proper divide number after SW has been biased to select the desired divide ratio.

- 1.1 GHz Toggle Frequency
- Supply Voltage of 4.5 to 5.5V
- Low-Power 4.0mA Typical
- Operating Temperature Range of -40 to $+85^{\circ}\text{C}$
- Short Setup Time (t_{set}) 16ns Maximum @ 1.1GHz
- Modulus Control Input Level Is Compatible With Standard CMOS and TTL

FUNCTIONAL TABLE

SW	MC	Divide Ratio
H	H	64
H	L	65
L	H	128
L	L	129

Note: SW: H = V_{CC} , L = Open

MC: H = 2.0 V to V_{CC} , L = GND to 0.8 V

DESIGN GUIDE

Criteria	Value	Unit
Internal Gate Count*	67	ea
Internal Gate Propagation Delay	200	ps
Internal Gate Power Dissipation	0.75	mW
Speed Power Product	0.15	pJ

* Equivalent to a two-input NAND gate

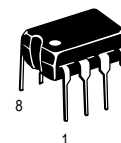
MAXIMUM RATINGS

Symbol	Characteristic	Range	Unit
V_{CC}	Power Supply Voltage, Pin 2	-0.5 to $+7.0$	Vdc
T_A	Operating Temperature Range	-40 to $+85$	$^{\circ}\text{C}$
T_{stg}	Storage Temperature Range	-65 to $+150$	$^{\circ}\text{C}$
MC	Modulus Control Input, Pin 6	-0.5 to $+6.5$	Vdc

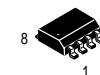
MC12022SLA MC12022SLB

MECL PLL COMPONENTS

$\div 64/65$, $\div 128/129$
**TWO-MODULUS
PRESCALER**

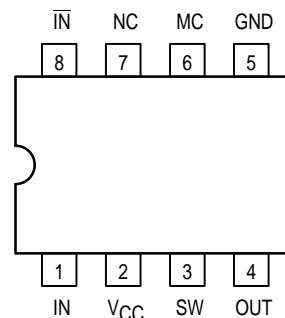


P SUFFIX
PLASTIC PACKAGE
CASE 626-05



D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751-05

Pinout: 8-Lead Plastic (Top View)



ELECTRICAL CHARACTERISTICS (V_{CC} = 4.5 to 5.5V ±10%; T_A = -40°C to +85°C)

Symbol	Characteristic	Min	Typ	Max	Unit
f _t	Toggle Frequency (Sine Wave Input)	0.1	1.4	1.1	GHz
I _{CCL}	Supply Current Output Unloaded (Pin 2) at 2.7Vdc		4.0	6.5	mA
I _{CCH}	Supply Current Output Unloaded (Pin 2) at 5.0Vdc		5.8	8.0	mA
V _{IH1}	Modulus Control Input High (MC)	2.0			V
V _{IL1}	Modulus Control Input Low (MC)			0.8	V
V _{IH2}	Divide Ratio Control Input High (SW)	V _{CC} - 0.5V	V _{CC}	V _{CC} + 0.5V	Vdc
V _{IL2}	Divide Ratio Control Input Low (SW)	Open	Open	Open	—
V _{out}	Output Voltage Swing (C _L = 8pF; R _L = 4.4kΩ)	1.0	1.6		V _{p-p}
t _{set}	Modulus Setup Time MC to Out		11	16	ns
V _{in(min)}	Input Voltage Sensitivity 250–1100 MHz 100–250 MHz	100 400		1500 1500	mVpp
I _O	Output Current (C _L = 8pF; R _L = 4.4kΩ)			1.0	mA

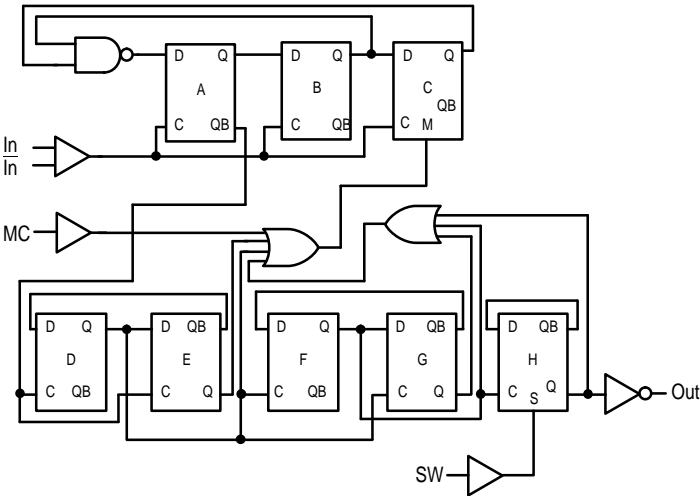
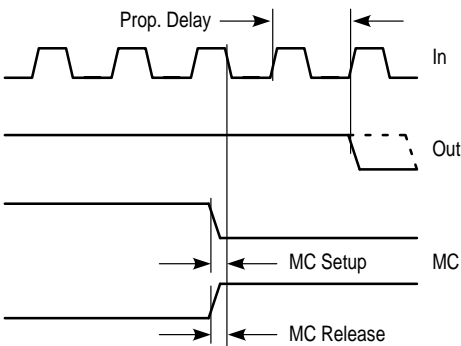
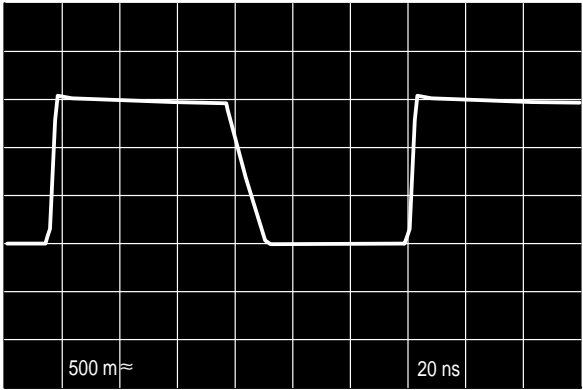


Figure 1. Logic Diagram (MC12022SLA)

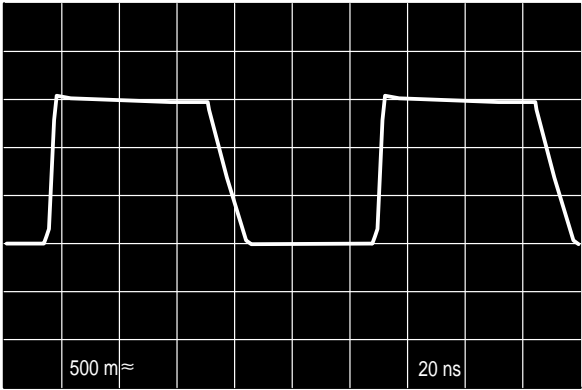


Modulus setup time MC to out is the MC setup or MC release plus the prop delay.

Figure 2. Modulus Setup Time



(÷64, 500MHz Input Frequency, V_{CC} = 5.0V, T_A = 25°C, Output Loaded)



(÷128, 1.1GHz Input Frequency, V_{CC} = 5.0V, T_A = 25°C, Output Loaded)

Figure 3. Typical Output Waveforms

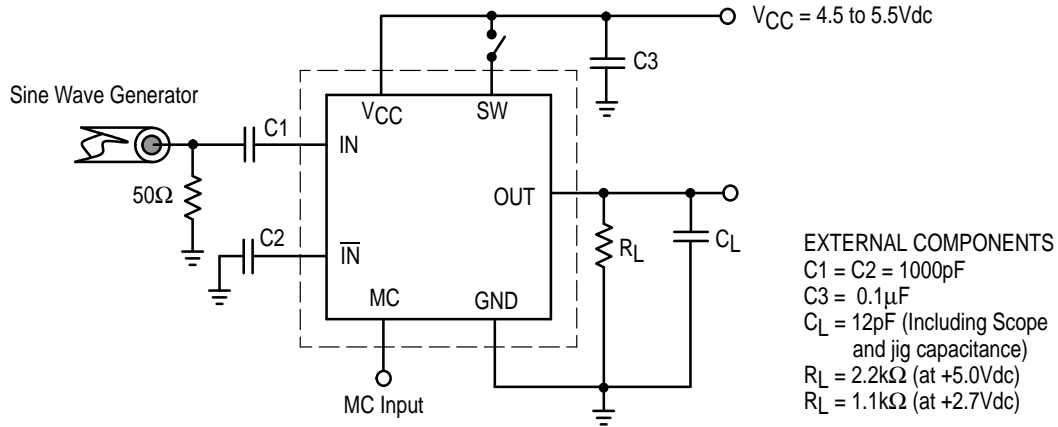


Figure 4. AC Test Circuit

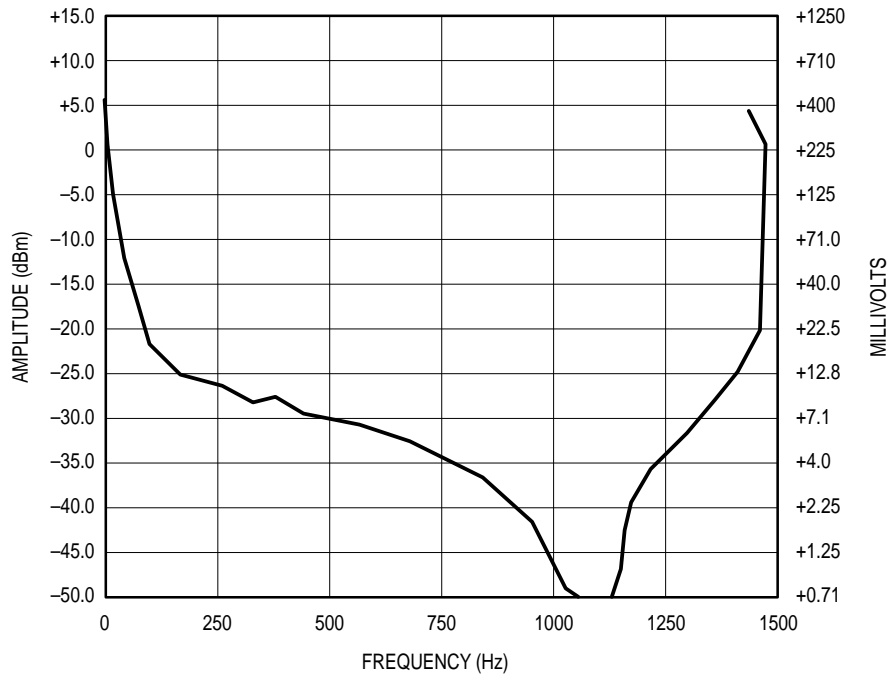


Figure 5. Input Signal Amplitude versus Input Frequency

Divide Ratio = 128; VCC = 5.0V; TA = 25°C

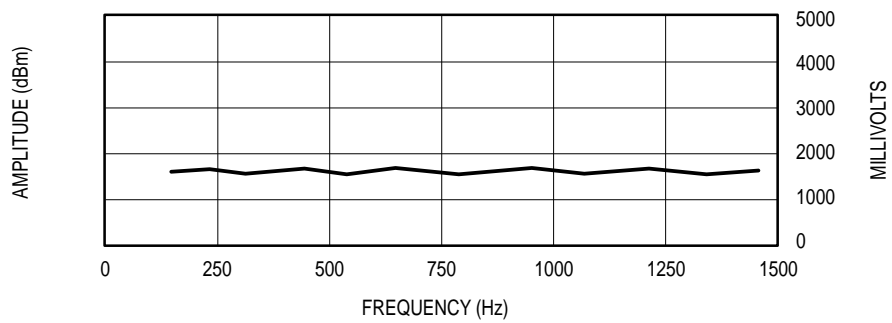


Figure 6. Output Amplitude versus Input Frequency

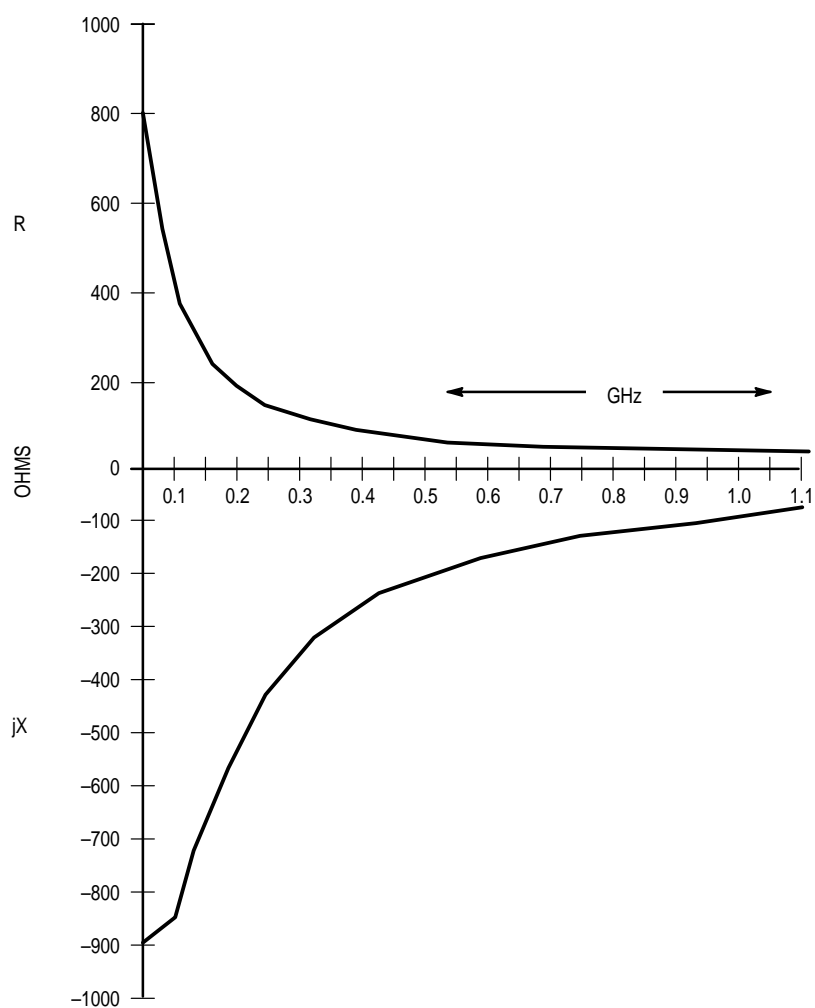
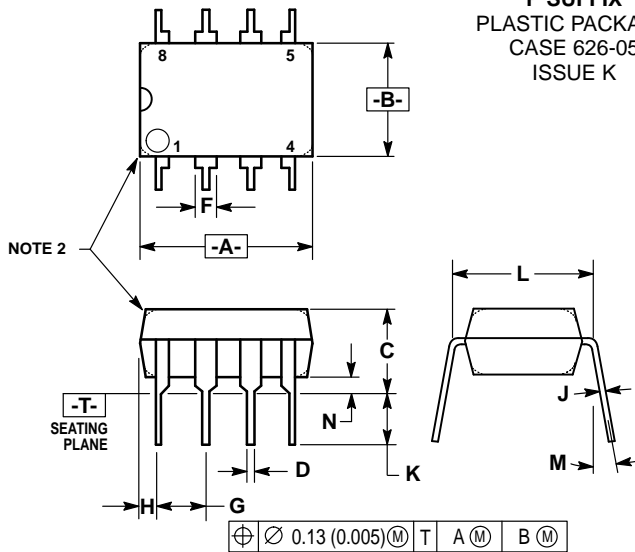


Figure 7. Typical Input Impedance versus Input Frequency

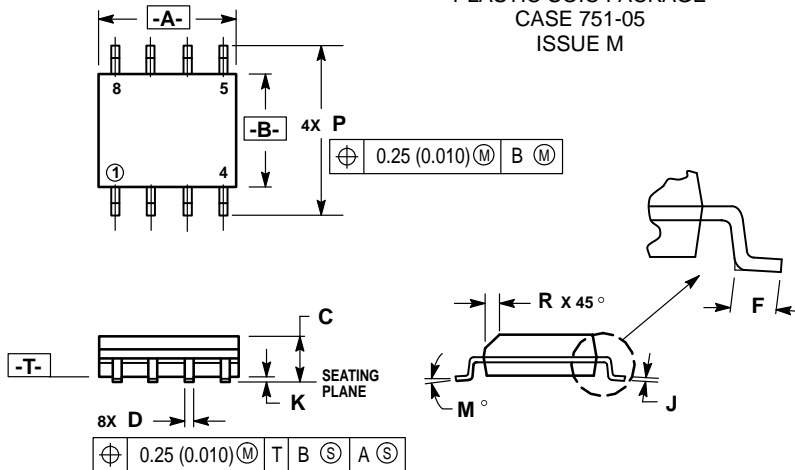
OUTLINE DIMENSIONS

P SUFFIX
 PLASTIC PACKAGE
 CASE 626-05
 ISSUE K


NOTES:

1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC	0.100 BSC		
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC	0.300 BSC		
M	—	10°	—	10°
N	0.76	1.01	0.030	0.040

D SUFFIX
 PLASTIC SOIC PACKAGE
 CASE 751-05
 ISSUE M


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC	0.050 BSC		
J	0.18	0.25	0.007	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Literature Distribution Centers:

USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.

EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.

JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141 Japan.

ASIA-PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.

